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Research Article

ASSOCIATION BETWEEN BONE MINERAL DENSITY LOSS DURING PREGNANCY AND PERSISTENT POSTPARTUM BACK PAIN

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ABSTRACT

Background: Back pain is a common issue during pregnancy, affecting 20-60% of women. While multiple factors contribute to pregnancy-related back pain, bone mineral density (BMD) loss has been positively associated with its severity. However, the relationship between postpartum BMD recovery and persistent back pain remains unclear. Objective: This study aimed to investigate the correlation between BMD loss during pregnancy and persistent back pain symptoms up to two years postpartum. Methods: A cohort of pregnant women was recruited at Sri Lakshmi Narayana Institute of Medical Sciences & Hospital over a 12-month period. Quantitative ultrasound measurements of BMD were taken at the os calcis in early and late pregnancy, and postpartum at 24-28 months. Women experiencing significant back pain during pregnancy completed pain assessments and were followed up with mailed questionnaires at two years postpartum. Participants with subsequent pregnancies were excluded. Regression analysis was used to evaluate correlations between BMD changes, body composition, and persistent back pain. Results: Among 926 participants, 460 reported significant back pain during pregnancy. At 24-28 months postpartum, 286 women (62%) completed follow-up, with 66 reporting persistent back pain. Women with chronic postpartum back pain exhibited greater BMD loss during pregnancy ($p = 0.044$) and had higher initial BMD levels in early pregnancy ($p = 0.031$). At two years postpartum, those with persistent back pain had significantly higher weight gain ($p = 0.041$) and lower BMD recovery. A positive postnatal BMD balance was protective against persistent pain ($p = 0.04$). Conclusion: This study demonstrated a significant association between BMD loss during pregnancy and persistent back pain symptoms two years postpartum. Women with higher initial BMD experienced greater losses, which were not fully recovered post-pregnancy, increasing the risk of persistent pain. Future studies should explore BMD recovery across different skeletal sites and its implications for osteoporosis risk and long-term bone health in women.

Keywords: - Pregnancy-related back pain, Bone mineral density (BMD), Ultrasound assessment, Os calcis, Persistent symptoms.

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INTRODUCTION

Back pain is a prevalent concern during pregnancy, affecting between 20% and 60% of expectant mothers [1-3]. While various factors contribute to this discomfort, bone loss has been positively linked to the severity of back and pelvic pain during pregnancy [4]. Specifically, reductions in femoral bone density have been associated with hip pain, whereas lower os calcis bone mineral density (BMD) correlates with back pain symptoms [5]. Importantly, these symptoms often persist beyond childbirth, with more than 60% of women

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continuing to experience postpartum back pain [6], increasing to as much as 82% among those with prior pregnancy-related back pain at 18 months postpartum. Even at two years postpartum, 21% of women still report ongoing discomfort [3].

The relationship between postpartum BMD loss, osteoporosis, and persistent pain remains a topic of debate [4]. It is essential to determine whether recovering BMD lost during pregnancy minimizes the risk of prolonged back pain [5-6]. To investigate this, women experiencing significant back pain during pregnancy will be observed to assess whether changes in postpartum BMD are linked to continued symptoms. Establishing this connection could lead to better strategies for managing and potentially reducing postpartum back pain.

METHODS

Pregnancy Cohort

This study was conducted at Sri Lakshmi Narayana Institute of Medical Sciences & Hospital over a 12-month period, recruiting consecutive patients receiving routine antenatal care. Upon enrollment, written informed consent was obtained, and early pregnancy weight and height data were collected. Between 36–38 weeks of gestation, quantitative ultrasound measurements of bone density were performed bilaterally at the os calcis using the Sahara Clinical Bone Sonometer. To ensure precise readings, elastomer pads and ultrasound coupling gel facilitated direct contact between the probe and the heel, while a stable, wheelless chair was used as per the manufacturer's guidelines. A foot guard was employed to maintain the correct probe alignment. Prior to assessment, participants were given 30 minutes for their skin to reach ambient temperature. Measurements were taken on both feet, and simulated BMD values were calculated based on broadband ultrasound attenuation (BUA) and speed of sound (SOS) parameters. The device's coefficient of variation (2-3%) was consistent with previous research findings.

Additionally, Tanita 500 bio-impedance systems were used to determine body fat percentage. Women with pre-existing medical conditions or on long-term medications known to affect bone density (e.g., steroids, thyroid medications) were excluded. Participants with spinal deformities, prior back surgery, or chronic back pain were also not included.

Before hospital discharge, postpartum patients were surveyed regarding back pain. Those who reported pregnancy-related back pain completed a pain distribution chart, and symptoms were categorized as mild, moderate, or severe using a visual analog scale (VAS). Back pain was classified as significant if it lasted more than three consecutive days or required medical intervention. Transient or mild symptoms were considered negative. The study aimed to investigate the relationship between back pain during pregnancy and interval changes in bone mineral density (BMD) [7].

Two-Year Study Cohort

To assess long-term postpartum back pain, a follow-up questionnaire was mailed to participants at the 24–28 months mark. Women reporting back pain within six months of receiving the questionnaire—particularly those requiring medical consultation, sick leave, or treatment—were classified as positive cases. Those who did not require medical intervention were considered negative. Women who had subsequent pregnancies by this follow-up period were excluded from further analysis.

For participants responding to the two-year postpartum survey, BMD measurements were repeated following the same quantitative ultrasound protocol. Data on menstrual status, last menstrual cycle, breastfeeding history, and any new medical conditions or medications were also collected. If pregnancy was confirmed at the time of follow-up, the participant was withdrawn from the study.

Anthropometric parameters, including body weight, body fat percentage, and os calcis BMD, were evaluated in relation to persistent postpartum back pain and pregnancy-related changes. The correlation between back pain and these variables was assessed using a regression model, with p-values ≤ 0.05 considered statistically significant. SPSS version 13.0 was used for all statistical analyses. The study was reviewed and approved by the Ethics Committee of Sri Lakshmi Narayana Institute of Medical Sciences.

RESULTS

460 of 926 patients recruited during pregnancy had experienced significant back pain. The 24-28 months questionnaire follow-up survey was completed by 286 women without further pregnancies, and 66 reported persistent back pain symptoms. 62% completed the 2-year survey, including 48 with persistent back pain and 72 without. Currently, 120 women are being analyzed from this final cohort. According to this cohort, the mean BMD loss from early to late gestation was 0.473 g/cm2, or around 5%. Two years after delivery, measurements showed marginally decreased BMD. In contrast, weight, body fat percentage, and BMI significantly increased during pregnancy, but fell again after delivery. All these parameters showed positive gains two years after delivery (Table 1). A 24-28-month assessment divided the cohort into groups with and without significant persistent back pain. The PBP group had a higher BMD in early pregnancy than the NBP group, but this was countered by a higher BMD loss during pregnancy compared to the NBP group. Comparing 24-28 month

values to early pregnancy values, the PBK group also gained more weight, and lost more BMD. In the index pregnancy, there was no difference in lactation duration. In the NBP group, BMD levels were almost identical to those in early pregnancy two years after delivery, almost recovering their BMD loss in pregnancy. There was a significant relationship between early and late pregnancy BMD values, as well as between late pregnancy BMD values and BMD values 24 to 28 months after delivery. All possible confounding continuous variables were controlled against persistent back pain at 24-28 months. The two-year weight gain and BMD changes remain significant, whereas pre-pregnancy BMD values and pregnancy BMD loss disappear. Persistent back pain is associated with more weight gain after delivery, whereas a positive balance in BMD is protective.

Table 1: Anthropometric changes during pregnancy and 24 to 28 months after delivery

	Early Pregnancy (< 20 weeks) (SD)	Late Third Trimester (36-38 weeks) (SD)	Two years post-delivery (SD)	P-value by ANOVA
Weight	57	66.5	60.3	< 0.001
Body Mass Index	23.7	27.6	25.1	< 0.001
Body Fat Composition (%)	30.4	38.3	33	< 0.001
Mean os calcis BMD (g/cm2)	0.738	0.701	0.716	< 0.001

Table 2: At 24-28 months, Comparison of anthropometric and BMD measurements.

	PBP group(n = 48)	NBP group(n = 72)	p-value; MD(95% CI)
Age	34.3	33.2	0.23
Height	158	157	0.68
Weight during early pregnancy	55.5	58	0.22
BMI during early pregnancy	23	24.2	0.12
Body fat percentage during early pregnancy	29.7	30.8	0.67
BMD in early pregnancy	0.786	0.705	0.031
Weight gain during pregnancy	10.55	10.43	0.98
Accumulation of pregnancy body fat	8.75	9.05	0.76
Loss of BMD during pregnancy	0.0572	0.0406	0.044
Duration of lactation during index pregnancy	9.8	9.1	0.60
2 years post-delivery weight change	4.68	3.86	0.041

Table 3: Logistic regression with persistence of significant back pain after delivery

Variable	B	S.E.	Wald	Significance	Odds ratio	95% CI
Variables that are significant Gaining weight 2 years after delivery	-0.753	0.403	5.62	0.04	2.92	2.05 to 4.48
2 years post-delivery BMD change	-22.9	11.26	5.55	0.04	0.12	0.02 to 0.106
Variables excluded Age	0.0629	0.213	0.303	0.75	2.05	0.94 to2.32
BMI during early pregnancy	-0.506	0.338	3.90	0.09	0.76	0.51 to 2.06
Fat percentage during early pregnancy	0.231	0.225	2.09	0.39	2.14	0.99 to 2.45
BMD in early pregnancy	0.308	4.944	0.003	0.105	2.23	0.04 to 6.7
Pregnancy weight gain	-0.041	0.229	0.068	0.90	0.106	0.85 to 2.24
Pregnancy fat gain	-0.353	0.311	2.434	0.33	0.87	0.61 to 2.17
Loss of BMD during pregnancy	26.26	17.97	3.21	0.23	0.47	0.07 to 9.91
Two years after delivery, fat changes	-0.506	0.367	3.32	0.23	0.77	0.49 to 2.13
Confidence interval = CI.						

DISCUSSION

In this study, quantitative ultrasound measurements demonstrated a progressive decline in

BMD at the os calcis from early to late pregnancy. Studies have used various methods for measuring BMD loss during pregnancy [8, 9], including quantitative ultrasound measurements [10, 11]. The current study found that around 50% of participants had back pain symptoms, which is in line with previous studies. Around 20% of patients complained of persistent back pain. The losses of BMD after pregnancy, during pregnancy, and during pregnancy were also associated with BMD loss. Previous studies have investigated back pain history, weight and older age , maternal smoking , pregnancy pain pattern, and psychosocial factors , but postpartum BMD changes have not been examined in detail for back pain persistence. Direct tests such as DXA and quantitative ultrasound could clearly demonstrate a marked bone turnover during pregnancy [12-15]. Long-term BMD loss is largely reversible [16, 17]. Back pain symptoms associated with BMD changes have been studied, but the long-term effects remain unclear. Pregnant women with documented back pain symptoms are more likely to experience subsequent symptoms [18]. In pregnancy, persistent back pain is associated with a greater loss of bone mineral density (BMD) and an inability to fully recover this loss after 2 years. The risk of developing clinical osteoporosis might be higher among women who suffer from severe back pain symptoms in later life.

Vertebral fractures and radiological abnormalities were rarely associated with severe persistent back pain. Many attribute low back pain to biomechanical factors, and immobility or reduced exercise could theoretically cause BMD loss. Back, pelvic, and hip pain symptoms are also associated with quantitative BMD loss. Back and pelvic pain symptoms are associated with lower BMD values during pregnancy. In pregnancy and afterward, osteoporosis, hip pain, and decreased femur bone density are associated. Therefore, pregnancy osteoporosis may go undetected. Additionally, we have not studied calcium intake or vitamin D status during or after pregnancy. Research on the recovery of BMD after pregnancy and delivery would be beneficial.

Chronic back pain women had high bone mineral density early in pregnancy, but then lost more bone mineral density during pregnancy. Pregnant women with higher BMD loss have higher BMD to begin with, whereas those with borderline low BMD appear to preserve their BMD better. During pregnancy, they lose less BMD. BMD loss during pregnancy was higher among women with persistent back pain after childbirth, which may have resulted in significant higher BMD loss during pregnancy.

This study had some limitations. However, of our original cohort (60/230) reporting back pain during pregnancy, only 26% (60/230) had BMD findings. While 55% had persistent back pain symptoms, 26% had BMD findings. The number of those who were available for follow-up assessments of their BMD was 33% for those without further pain; 73% for those who had further pain. Secondary analyses revealed no significant differences between those who completed the follow-up study versus those who defaulted on it in terms of epidemiological characteristics, BMD loss during pregnancy, and back pain. This group should thus represent the entire cohort, based on the data presented here. Also, despite a tiny sample size in the final cohort, body fat differences were not demonstrated after two years. However, the current cohort already showed significant and consistent differences in primary outcomes like BMD loss during pregnancy.

Generally, quantitative ultrasound measurements of BMD predict clinical osteoporosis and fractures as well as DXA measurements. The coefficient of variation of these quantitative ultrasound systems can affect serial longitudinal comparisons, especially when the absolute difference is smaller than the coefficient. As a result, we believe that these measurements are valid, as measurable BMD loss during pregnancy was significantly greater (5-7%) than expected. Several studies and our own data indicate that quantitative ultrasound systems produce consistent and reproducible results. The correlation coefficients between pregnancy BMD and 2-year follow-up values were extremely high. Such BMD measurements should be reproducible over time. DXA or peripheral quantitative computer tomography could also be used to measure the axial skeleton more precisely after pregnancy, which should result in lower coefficients of variation. It is, however, not possible to directly correlate BMD changes during pregnancy with these methods because of the theoretical risks of radiological exposure. The same measurement method was used after pregnancy, despite its limitations. BMD recovery back to pre- or early pregnancy levels can be monitored with quantitative ultrasound

CONCLUSION

Overall, this study supported a correlation between BMD loss, as measured by quantitative ultrasound, and persistent back pain symptoms during pregnancy. Future large-scale studies should use BMD measurements at different skeletal sites to correlate persistent back pain symptoms. The risk of osteoporosis and menopausal bone health needs to be considered if BMD can be recovered during pregnancy.

REFERENCES

1. Ostgaard HC, Andersson GBJ, Karlsson K. (1991). Prevalence of back pain in pregnancy. *Spine*, 16, 549-552.

2. Orvieto R, Achiron A, Ben-Rafael Z, Gelernter I, Achiron R. (1994). Low back pain in pregnancy. *Acta Obstet Gynecol Scand*. 73, 209-214.
3. To WWK, Wong MWN. (2003) Factors associated with back pain symptoms in pregnancy and the persistence of pain 2 years after pregnancy. *Acta Obstet Gynecol Scand*, 82, 1086-1091.
4. Funk JL, Shoback DM, Genant HK. (1995). Transient osteoporosis of the hip in pregnancy: natural history of changes in bone mineral density. *Clin Endocrinol*, 43, 373-382.
5. To WWK, Wong MWN. (2009). Back pain symptoms and bone mineral density changes in pregnancy as measured by quantitative ultrasound. *Gynecol Obstet Invest*, 67, 36-41.
6. Fung BK, Kwong CM, Ho ES. (1993) Low back pain of women during pregnancy in the mountainous district of central Taiwan. *Chung Hua I Hsueh Tsa Chih, Tappei*, 51, 103-106.
7. Ostgaard HC, Andersson GBJ, Wennergren M. (1991). The impact of low back pain and pelvic pain in pregnancy on the pregnancy outcome. *Acta Obstet Gynecol Scand*, 70, 21-24.
8. Breen TW, Ransil BJ, Groves PA, Oriol NE. (1994). Factors associated with back pain after childbirth. *Anaesthesiology* 81, 29-34.
9. Lindal E, Hauksson A, Sigrun A, Hallgrimsson. (2000) Low back pain, smoking and employment during pregnancy and after delivery - a 3-month follow-up study. *J Obstet Gynaecol* 20, 263-266.
10. Bjoklund K, Naessen T, Nordstrom ML, Bergstorm S. (1991). Pregnancy-related back and pelvic pain and changes in bone density. *Acta Obstet Gynecol Scand* 78, 681-685.
11. Drinkwater BL, Chesnut CH. (1991). Bone density changes during pregnancy and lactation in active women: a longitudinal study. *Bone Miner* 14, 153-160.
12. Kolthoff N, Eiken P, Kristensen B, Nielsen SP. (1998) Bone mineral changes during pregnancy and lactation: a longitudinal cohort study. *Clin Science* 94, 405-412.
13. Aguado F, Revilla M, Hernandez ER, Menendez M, Cortes-Prieto J, Villa LF, Rico H. (1998). Ultrasonographic bone velocity in pregnancy: a longitudinal study. *Am J Obstet Gynecol* 178, 1016-1021.
14. Pluskiewicz W, Drozdzowska B, Stolecki M. (2004). Quantitative ultrasound at the hand phalanges in pregnancy: a longitudinal study. *Ultrasound Med Biol*, 30, 1373-1378.
15. To WWK, Wong MWN, Leung TW. (2003). Relationship between bone mineral density changes in pregnancy and maternal and pregnancy characteristics: a longitudinal study. *Acta Obstet Gynecol Scand* 82, 820-827.
16. Paparella P, Giorgino R, Maglione A, Lorusso D, Scripa P, Del-Bosco A, Mancuso S. (1995). Maternal ultrasound bone density in normal pregnancy. *Clin Exp Obstet Gynecol* 22, 268-278.
17. Noren L, Ostgarrd S, Johansson G, Ostgaard HC. (2002). Lumbar back and posterior pelvic pain during pregnancy: a 3-year follow-up. *Eur Spine J* 11, 267-271.
18. Ostgaard HC, Zetherstrom G, Ross-Hansson E. (1997). Back Pain in relation to pregnancy: a 6-year follow-up. *Spine* 15, 2945-2950.

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